

Key

TOXINS SECTION II TEST REVIEW

Lessons 8-11, 25

Lesson 8 – Counting by Weighing

1) What is “counting by weighing” and when is it useful?

* Determining number of items by weighing sample and dividing by mass of one or small group of items * Count large # of small items

2) One lentil weighs 0.056 g. A sample of lentils weighs 745 g. How many lentils are in the sample?

$$\frac{\text{Total Mass}}{\text{Single Item Mass}} = \# \text{ Items} \quad \frac{745 \text{ g}}{0.056 \text{ g}} = \boxed{1.33 \times 10^4 \text{ lentils}}$$

3) The formula to find percent error is:

$$\% \text{ error} = \left| \frac{\text{observed value} - \text{actual value}}{\text{actual value}} \right| \times 100$$

4) Orville uses his thermometer and finds the boiling point of ethyl alcohol to be 75° C. He looks in a reference book and finds that the actual boiling point of ethyl alcohol is 78° C. What is his percent error?

$$\% \text{ error} = \left| \frac{75 - 78}{78} \right| \times 100 = \boxed{3.85\%}$$

5) The density of water at 4°C is known to be 1.00 g/mL. Bary Um experimentally found the density of water to be 1.085 g/mL. What is his percent error?

$$\% \text{ error} = \left| \frac{1.085 - 1}{1} \right| \times 100 = \boxed{8.5\%}$$

Lesson 9 – Avogadro's Number

6) What is Avogadro's # and what does it represent?

6.02×10^{23} : # of items in a mole (Just like 12 items = 1 dozen)

7) a) What is molar mass? Mass of one mole of a substance

b) What are its units? g/mol

c) Where can it be found for an element?

Periodic table

8) Determine the molar mass of the following examples. Round to the hundredths place:

a) Cr

$$52.00 \text{ g/mol}$$

b) BeCl_2

$$\begin{array}{r} 9.01 \\ + (35.45 \times 2) \\ \hline 79.91 \text{ g/mol} \end{array}$$

c) Mg(OH)_2

$$\begin{array}{r} 24.31 \\ (16.00 \times 2) \\ + (1.01 \times 2) \\ \hline 58.33 \text{ g/mol} \end{array}$$

d) H_3PO_4

$$\begin{array}{r} (1.01 \times 3) \\ 30.97 \\ + (16.00 \times 4) \\ \hline 98.00 \text{ g/mol} \end{array}$$

9) Write the following numbers in scientific notation:

a) 0.000000054

$$5.4 \times 10^{-8}$$

b) 2,500,000,000

$$2.5 \times 10^9$$

c) 0.00000000000845

$$8.45 \times 10^{-12}$$

10) Write the following numbers in the longhand format:

a) 6.8×10^5

$$680,000$$

b) 2.5×10^{-7}

$$0.00000025$$

Lesson 10: Molar Mass and Percent Composition

11) a) Determine the molar mass of NaCl.

$$22.99 + 35.45 = \boxed{58.44 \text{ g/mol}}$$

b) How many moles are in 29.22 g NaCl?

Mass \rightarrow Mole

$$\frac{29.22 \text{ g}}{58.44 \text{ g/mol}} = \boxed{0.5 \text{ mol NaCl}}$$

c) How many moles are in 116.88 g NaCl?

Mass \rightarrow Mole

$$\frac{116.88 \text{ g}}{58.44 \text{ g/mol}} = \boxed{2 \text{ mol NaCl}}$$

12) Which has more moles: 1.0 g methanol (CH_4O) or 1.0 g ethanol ($\text{C}_2\text{H}_6\text{O}$)? Explain or show your work.

* Explanation: 1.0 g Methanol has more moles because its molar mass is smaller

$$\text{* Work: } \frac{1 \text{ g CH}_4\text{O}}{32.05 \text{ g/mol}} = 3.1 \times 10^{-2} \text{ mol} \quad \text{vs.} \quad \frac{1.0 \text{ g C}_2\text{H}_6\text{O}}{46.08 \text{ g/mol}} = 2.17 \times 10^{-2} \text{ mol}$$

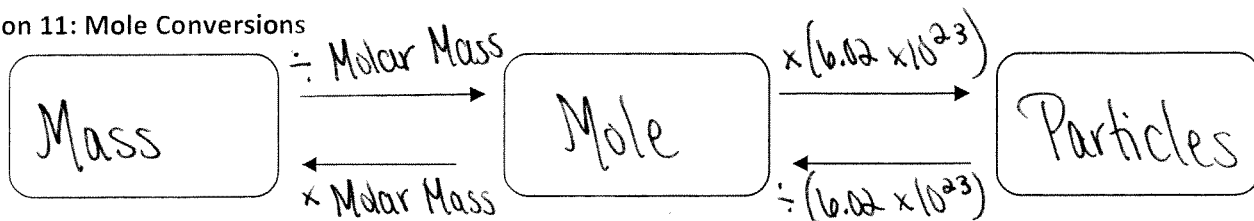
13) Calculate the % composition by mass of HgCl_2 . Show your work.

$$\text{HgCl}_2 \text{ molar mass: } 200.59 + (35.45 \times 2) = 271.49 \text{ g/mol}$$

$$\% \text{ Hg} = \frac{200.59}{271.49} \times 100 = \boxed{73.88 \% \text{ Hg}}$$

$$\% \text{ Cl} = \frac{(35.45 \times 2)}{271.49} \times 100 = \boxed{26.12 \% \text{ Cl}}$$

Lesson 11: Mole Conversions



14) How many moles are in 125 g H₂O?

Mass → Mole

$$125 \text{ g H}_2\text{O} \div 18.02 \text{ g/mol} = \boxed{6.9 \text{ mol H}_2\text{O}}$$

15) How many molecules are in 3.5 moles CO₂?

Mole → Molecule (Particle)

$$3.5 \text{ mol} \times (6.02 \times 10^{23}) = \boxed{2.1 \times 10^{24} \text{ molecules}}$$

16) What is the mass of 10 moles of HCl?

Moles → Mass

$$10 \text{ mol} \times 36.46 \text{ g/mol} = \boxed{364.6 \text{ g}}$$

17) How many moles is 5.5×10^{30} molecules CO₂?

Molecules (Particle) → Mole

$$\frac{5.5 \times 10^{30}}{6.02 \times 10^{23}} = \boxed{9.1 \times 10^6 \text{ mol}}$$

18) What is the mass of 1.204×10^{24} atoms of He?

Atoms (Particle) → Mole → Mass

$$\text{Step 1: } \frac{1.204 \times 10^{24}}{6.02 \times 10^{23}} = 2 \text{ mol He} \quad \text{Step 2: } 2 \text{ mol He} \times 4.00 \frac{\text{g}}{\text{mol}} = \boxed{8 \text{ g He}}$$

19) How many molecules are in 35 g NH₃?

Mass → Mole → Molecule (Particle)

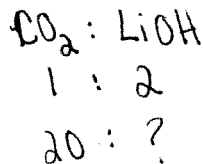
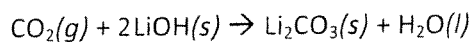
$$\text{Step 1: } \frac{35 \text{ g NH}_3}{17.04 \text{ g/mol}} = 2.05 \text{ mol NH}_3$$

$$\text{Step 2: } 2.05 \text{ mol} \times (6.02 \times 10^{23}) = \boxed{1.23 \times 10^{24} \text{ molecules}}$$

Lesson 25: Stoichiometry – Mole Ratios and Conversions

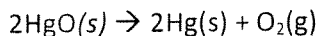
20) In a spacecraft, the carbon dioxide exhaled by astronauts can be removed by its reaction with lithium hydroxide, LiOH, according to the chemical equation below.

How many moles of lithium hydroxide are required to react with 20 mol of CO₂, the average amount exhaled by a person each day?



$$20 \text{ mol} \times 2 = 40 \text{ mol LiOH}$$

21) Oxygen was discovered by Joseph Priestley in 1774 when he heated HgO to decompose it to form its constituent elements.

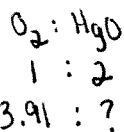


How many moles of HgO are needed to produce 125 g O₂?

Step 1: Mass O₂ → Mol O₂

$$125 \text{ g O}_2 \div 32.00 \text{ g/mol} = 3.91 \text{ mol O}_2$$

Step 2: Mol O₂ → Mol HgO

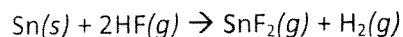


$$3.91 \times 2 = 7.82 \text{ mol HgO}$$

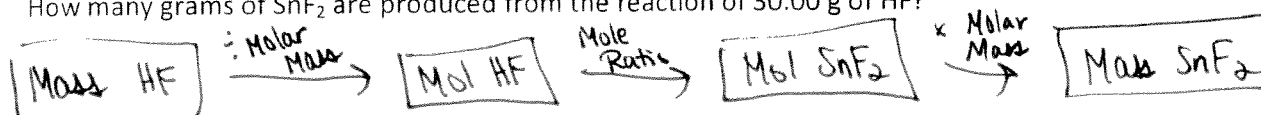
~~Step 3: Mol HgO → Mass HgO~~

$$7.82 \text{ mol} \times 216.59 = 1.69 \times 10^3 \text{ g HgO}$$

22) Tin(II) fluoride is sometimes used in toothpastes. It is made by the reaction of tin with hydrogen fluoride according to the following equation:



How many grams of SnF₂ are produced from the reaction of 30.00 g of HF?



$$30 \text{ g HF} \div 20.01 \frac{\text{g}}{\text{mol}} = 1.5 \text{ mol HF} : 0.75 \text{ mol SnF}_2$$

$$0.75 \text{ mol SnF}_2 \times 156.71 \frac{\text{g}}{\text{mol}} = 117.53 \text{ g}$$